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GAS ABSTRACTS

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1. GAS INDUSTRY

Coal vs. Oil

Ozanne, H. STIFF COMPETITION AHEAD —COAL VS. OIL. *World Oil* **127**, 81-82, 84 (1947) *November.*

Because of the large reserves of coal, the recent promise of technical advances in the coal industry, and the rising price levels of petroleum products, it is predicted that oil will enjoy a less favorable competitive position in the future.

H. R. Batchelder

Federal Power Act

Campbell, C. L. AMENDMENTS TO THE FEDERAL POWER ACT. *Public Utilities Fortnightly* **40**, 679-682 (1947) *November* 20.

A discussion is given in favor of amendments to the Federal Power Act which would define the powers of the Commission more exactly and in particular eliminate F.P.C. control over any utility clearly under state control and over any non-utility company.

H. R. Batchelder

FPC Regulations

Smith, N. L. REGULATION OF GAS UTILITIES. *Am. Gas Assoc. Monthly* **29**, 489-491, 505 (1947) *November.*

The chairman of the Federal Power Commission discusses the major current issues involving questions of jurisdiction, rate-making and service.

H. R. Batchelder

LP–Gas

Lowe, W. F. FACTORS IN THE FUTURE OF THE LP-GAS INDUSTRY. *Petroleum Refiner* **26**, 125-129 (1947) *November.*

A general discussion of the LP-gas future is given. The unexpected and tremendous increase in demand for LP- gas after the war created many problems. The increased diversion of butane to motor fuel has contributed to the present short supply. The author urges large increases in storage capacity, particularly at consumption points and installed by the consumer.

H. R. Batchelder

LP–Gas Sales

Coumbe, A. T. LP-GAS SALES INCREASED 34 PER CENT LAST YEAR. *Gas Age* **100**, 17-18, 49, 50 (1947) *October* **16.**

Domestic deliveries of liquefied petroleum gases sold for fuel, chemical raw material and synthetic rubber components increased from 1,276,-766,000 gallons to 1,705,282,000 in 1946—a gain of 34 per cent. An analysis of the statistics of the uses, and the relative proportions of the different LP-gases for the different uses is given. Tables showing the expansion of the industry over a period of seven years are also given.

L. Ciboch

Pipe Line Demand

McConnor, W. F. PRESENT AND PROSPECTIVE OUTLOOK FOR LINE PIPE AND TUBULAR GOODS. *Pipe Line News* **19**, 7-9 (1947) *October.*

The author presents a brief analysis of pipe line demands including the trend to greater quantities and larger sizes. No real solution to the problem of filling firm orders at an early date is proposed.

J. D. Parent

Price Relationships

Ball, M. W. NEEDED: A PROPER FUEL PRICE RELATIONSHIP. *Gas* **23**, 33-36 (1947) *November.*

The author argues that, in order to maintain a reasonable and proper balance among the three fuel sources, gas, oil and coal, there must be a range in which the relative prices of the three are dictated by normal economic laws, unhindered by the regulation of gas prices alone.

H. R. Batchelder

Transportation Costs

Kayser, P. GAS LINES—COAL CARRIERS OF THE FUTURE. *Gas* **23**, 44-46 (1947) *November.*

The author compares the cost of transporting coal by rail with that of transporting gas by pipe-line, and shows that gas transportation is very much cheaper. The major part of the existing grid of large-diameter gas lines pass sufficiently close to major coal deposits to be useful when high B.t.u. gas from coal is a part of the energy picture of the future.

H. R. Batchelder

2. APPLIANCES

Air Conditioning

Smith, F. C. OPPORTUNITY IN GAS AIR-CONDITIONING. *Am. Gas Assoc. Monthly* **29**, 479-482, 514-515 (1947) *November; Gas Age* **100**, 36-38, 74, 78, 80 (1947) *November* **13.**

This paper was given before the Residential Gas Section of the American Gas Association convention in Cleveland, October 6, 1947. The author presents figures to show the load-building potentialities of gas fired year round air conditioning and describes, among others, the unit which Servel is producing at present. He states that the response of the gas companies has in general been very disappointing and that without aggressive promotion much ground will be lost to electric motor driven refrigeration units.

H. R. Batchelder

Gas Appliances

Zare, M. and Milener, E. D. DOMESTIC GAS APPLIANCE DEVELOPMENT IN U. S. A.

Gas World (*British*) 127, 381-384 (1947) *September* 13.

A general description of the domestic gas appliances in United States as presented at the World Power Conference, is given.

E. F. Davis

Heat Pump

Penrod, E. B. CONTINUOUS AIR CONDITIONING WITH THE HEAT PUMP. *American Scientist* 35, 502-524 (1947) *October.*

This article discusses the various types of heat pumps and gives a comparison of the operating characteristics. Some discussion is also given of comparative operating characteristics and coefficients of performance.

E. F. Davis

House Heating Systems

TESTS DEVELOPED FOR HOUSE HEATING SYSTEMS. *Gas Appliance Merchandising* 19, 20-21 (1947) *October.*

A non-technical discussion of tests being conducted by the National Bureau of Standards on small house heating systems is given.

E. F. Davis

Oven Controls

Hense, H. J. TESTING OVEN CONTROLS. *Am. Gas Assoc. Monthly* 29, 483-484, 508 (1947) *November.*

A discussion of Research Bulletin No. 44 of the American Gas Association Testing Laboratories on types of automatic oven temperature controls is given. The snap acting (full-on—full-off) type of control permitted a lower oven temperature but is attended by more noise and the possibility of flash backs. The graduated type of control maintains a steadier temperature, causes less noise, but will not satisfactorily control temperatures below about 250°F.

H. R. Batchelder

Panel Heating

Ayres, J. M. and Levy, B. W. AIR TEMPERATURE GRADIENTS IN A PANEL HEATED ROOM. *Heating, Piping & Air Conditioning* 19, 113-117 (1947) *October.*

This article discusses the results of tests to determine temperature gradients in a panel heated room using various panels such as wall, floor and ceiling. It appears that floor panels give a more uniform vertical temperature distribution.

E. F. Davis

Space Heating

Andrew, L. W. and Roberts, A. L. FUNCTION OF CONVECTION AND RADIATION IN HEATING BY GAS. *Gas J.* (*British*) 252, 207-208, 211-212 (1947) *October* 22.

The authors attempt to show the effect of convection and radiation on heat transfer when using gas for space heating. The authors maintain that ideal comfort conditions exist only when the surrounding air temperature is somewhat less than the usual 68°F. and that the person be exposed to a source of radiant heat

at a temperature somewhat above that of the air. This condition should be maintained at all times by controlling the air circulation. It is further suggested that radiation of a very definite wave length may give ideal comfort while radiation with a wave length one micron more or one micron less will cause a feeling of stuffiness.

E. F. Davis

Space Heating

RESEARCH IN HOME COMFORT. *Am. Gas Assoc. Monthly* 29, 443-444 (1947) *October.*

A brief summary of the research work being conducted for the Committee on Domestic Gas Research of the American Gas Association on improved methods of house heating is given.

E. F. Davis

3. COMBUSTION AND INDUSTRIAL FURNACES

Gas Carburizing

Holcroft, W. H. and Bayer, E. C. CONTINUOUS GAS CARBURIZING OF STEEL WITHOUT A GAS GENERATOR. *Materials & Methods* 26, 92-93 (1947) *October.*

Gas carburizing usually accomplished by controlled furnace atmospheres consisting of hydrocarbon and diluent gases requires, in most cases, a separate diluent gas generator. Recent developments in carburizing technique have shown, however, that in many coals the gas generator can be dispensed with by using recirculated furnace gases as the diluent portion of the carburizing gas. An installation cited by the author successfully employed mixtures of city gas, propane and recirculated furnace gases in the treatment of ports for a leading farm implement manufacturer.

C. Von Fredersdorff

Industrial Ovens

Litzler, C. A. THE DESIGN OF INDUSTRIAL OVENS WITH SPECIIAL REFERENCE TO SAFETY. *Ind. Heating* 14, 1710-1712, 1714-1715 (1947) *October.*

See *Gas Abstracts* 3, 161 (1947) *October* for abstract.

Infrared Ovens

Carne, J. B. THE ROLE OF CONVECTION IN MEDIUM TEMPERATURE PROCESSING WITH SPECIAL REFERENCE TO ITS INFLUENCE ON THE DESIGN OF "INFRARED" OVENS. *Fuel (British)* 26, 90-101 (1947) *July-August.*

This article discusses the difference between radiation and convection heat transfer in low and high temperature ovens. Also included are graphs and data from experiments on heat transfer through various size tubes.

E. F. Davis

4. CARBONIZATION AND GASIFICATION

Carbonization

WORLD DEVELOPMENTS IN CARBONIZATION. *Coke & Gas* (*British*) 9, 256-260, 266 (1947) *September.*

Some 70 to 80 papers presented at the 1947 World Power Conference on the subject of fuel economy covered rather broadly the following developments: upgrading poor fuels by briquetting and drying; utilization of coke oven gas in chemical industry; pressure gasification of cheap non-coking coals by means of steam and oxygen; underground gasification of oil shale; benzole extraction by activated carbon and recirculated gas; dry quenching of coke for process and power steam; better utilization of gas by means of improved appliances. Practical ideas for future development in the field of gas utilization are suggested.

C. Von Fredersdorff

Carbonizing Plant

THE NEW CARBONIZING PLANT AT TINGLEY. *Gas Times* (*British*) 52, 229-230, 232 (1947) *August* 16.

A new carbonizing plant, the major portion of which is to be built by the Woodall-Duckham Company, when completed will consist of 144 recuperative intermittent vertical chambers arranged in four rows of two batteries in tandem. The installation is designed for a capacity of 1000 tons per day and is estimated to produce 14 million cu. ft. 505 B.t.u. gas per day after extraction of the benzole, yield of 2 gal./ton. The carbonizing chambers, arranged in batteries of 18, further subdivided into 3 groups of 6, and measuring 21½ ft. high x 10 ft. long x 12½ in. wide at the bottom, are to be heated by firing producer gas through horizontal flues. Each chamber is tapered to allow easy discharge of coke. Each section of 6 chambers has a step-grate producer and is provided with two counter-flow recuperators built into the setting. The coal handling plant is arranged in duplicate breaking and conveying systems, either of which can act as a standby to the other. The gas and by-product collecting system and coke handling system are of conventional nature. Details of these as well as a description of waste heat boilers and ash handling are included.

C. Von Fredersdorff

Coal Gasification

Parry, V. F., Gernes, D. C., Wagner, E. O., Goodman, J. B. and Koth, A. W. GASIFICATION OF LIGNITE AND SUBBITUMINOUS COAL. *U. S. Bureau of Mines Report of Investigations* 4128, (1947) *September.*

This report is a progress report for 1945-1946 and discusses (1) the operation of a commercial scale pilot plant at Grand Forks, North Dakota, and (2) a comparison of small and large pilot plants.

H. R. Batchelder

Dehydration

Whitehead, M. H. TOWN GAS DEHYDRATION. *Natl. Gas Bull.* (*Australia*) 11, 14-17 (1947) *July-August.*

The water vapor in town gas (usually saturated

at the distribution temperature and pressure) gives rise to serious problems in deposition of water and corrosion in underground pipes. Serious thought is given to the partial dehydration of the distributed gas to a dew point at least 5° below the lowest distribution temperature. This could be accomplished by refrigeration, compression and subsequent cooling, absorption by solutions whose vapor pressure is lowered by suitable solutes as $CaCl_2$ or glycerin and adsorption on the surface of activated agents. Reabsorption of water vapor in a water-sealed gas holder is prevented by introducing a film of oil over the holder water. It is believed the advantages gained would offset the additional cost of dehydration. Advantages and disadvantages are summarized.

C. Von Fredersdorff

Storage

Resnick, I. THE ECONOMICS OF B. T. U. STORAGE. *Gas Age* 100, 40-41, 60, 64-66 (1947) *October* 30.

A survey is presented of the factors affecting the choice of a means for storage of gas to meet hourly, daily or seasonal peaks. Among those considered are low, intermediate and high pressure containers for storage of gas; underground reservoirs; storage of normally liquid hydrocarbons to be gasified; of LP-gases for direct use; and storage of natural gas in solution, in liquefied form or as hydrate.

H. R. Batchelder

Underground Gasification

Clendenin, J. D. UNDERGROUND GASIFICATION. *Chem. Eng. Progress "Trans. Section"* 43, 581-584 (1947) *November.*

A summary and review of the information at present available on this subject is given. Much of the work reported is that done in Russia and is not always consistent nor has it been verified. Very little information is given on the results of the recent experiment at the Gorgas mines.

H. R. Batchelder

The following article, which has not been abstracted, is called to your attention:

Lowry, H. H. and Rose, H. J. POTT-BROCHE COAL - EXTRACTION PROCESS AND PLANT OF RUHROL G.m.b.H., BOTTROP-WILHEIM, GERMANY. *U. S. Bureau Mines Information Circular* 7420 (1947) *October.*

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Centrifugal Compressor

McDonald, D. CENTRIFUGAL COMPRESSOR INSTALLATION AT THE SEELIGSON PROJECT. *Calif. Oil World* 40, 3. 5, 7, 9, 11, 13, 15, 17, 19 (1947) *October.*

For a particular project the centrifugal compressor offers advantages over the reciprocating type, but the author warns against generalization. Much general information on performance is supplied.

J. D. Parent

Corrosion

Shock, D. A. and Hackerman, N. CORROSION STUDIES IN NATURAL GAS CONDENSATE WELLS. *Ind. Eng. Chem.* **39**, 1283-1286 (1947) *October.*

The mechanism and the effect of a natural inhibitor upon a steel surface in the gas condensate well is described. A means of identifying the natural inhibitor present and the type of protective form is given. In addition, the type of protection provided by sodium chromate and its disadvantages under reducing conditions frequently found in wells is also discussed.

S. Mori

Cycling

Bennett, E. O. CYCLING AT HIGH PRESSURE VS. DEPLETION AND CYCLING AT LOW PRESSURES. *Calif. Oil World* **40**, 25-29, 64 (1947) *October.*

The author defines cycling as recovery of condensate from a single phase reservoir and returning the denuded gas. When oil is produced and gas returned the project is called pressure maintenance. Whether to attempt pressure maintenance at its initial value or to inject gas after partial depletion is a major problem since the equipment required will vary somewhat. Reasons for pressure maintenance such as keeping viscosity low, preventing encroachment and producing oil at a maximum rate are stated. It is then pointed out that certain factors such as the nature of the reservoir fluid are important. For a two phase reservoir, pressure decline prior to cycling is wasteful, but as shown recently by Standing et al. this method is probably best for a gas cap or retrograde pool. The various factors of importance are qualitatively discussed and certain generalizations presented. Thus it is stated that it is not profitable to build a cycling plant when a satisfactory gas market exists unless the oil to gas ratio is at least 50 bbls. per MMcf of gas. The answer for a particular reservoir must be determined on the basis of an economic analysis.

J. D. Parent

Dehydration Plant

Short, E. H. Jr. COMPACT PLANT DEHYDRATES GAS AND METERS DISTILLATE. *Oil Gas J.* **46**, 88-89 (1947) *September* 13.

For some time Continental Oil Company has had in operation in southwestern Louisiana several compact dehydration and metering plants. Typical of these plants is on the lease of the H. M. Naylor Oil Company in the West Mermentau field. This plant is handling approximately 13,000,000 cu. ft. of gas per day from 3 Naylor wells and 13 Continental wells. Pictures of the important installations in the plant with a brief description of their operation are given.

E. Strong

Dual Completions

Miller, E. B., Jr. SURVEY OF DUAL COMPLETIONS. *Oil Gas J.* **46**, 276-278 (1947) *November* 15.

The percentage of wells being dually completed is decreasing rapidly, largely because of the operational difficulties due to corrosion. Eleven disadvantages and six advantages are listed for dual completed wells.

J. D. Parent

Estimation of Gas Reserves

Gruy, H. J. and Crichton, J. NATURAL-GAS RESERVES. *Oil Gas J.* **46**, 88-89, 116 (1947) *October* 25.

A critical review of the methods used in the estimation of natural gas reserves is presented. Inaccuracy of test results and ignoring deviations from the ideal gas law are stressed.

J. D. Parent

Extraction Plants

EXTRACTION PLANTS REPLACE GAS FLARES. *Petroleum Processing* **11**, 857-860 (1947) *November.*

Humble Oil and Refining Company is proceeding with plans to eliminate flaring of gas where possible. A $10,000,000 over-all plan is envisaged. New Clear Lake facilities are discussed in detail.

J. D. Parent

House Heating

Ginna, R. E. WHAT TO DO ABOUT HOUSE HEATING. *Gas Age* **100**, 21-22, 54, 56 (1947) *October* 16.

This article establishes some very definite methods for saving the house heating load before the demand decreases. This is recommended reading for everyone in the gas business.

E. F. Davis

Injection Program

McCaslin, L. S., Jr. LOW-COST INJECTION PROGRAM STARTED IN TEXAS PANHANDLE. *Oil Gas J.* **46**, 97 (1947) *September* 13.

After a successful 6 month trial period, the Texas Railway Commission has approved a cooperative gas-injection program for the 600-acre McConnell area of the Panhandle field of Texas. The input-well pressure is sufficiently lower than that of the source wells to enable injection without the use of compression. It is expected that gas-repressuring will prolong considerably the productivity of the oil wells in this area.

E. Strong

Propane Tank Ship

Tuttle, R. B. WARREN COMPLETES FIRST OCEAN-GOING PROPANE TANK SHIP. *Oil Gas J.* **46**, 50-51, 251 (1947) *October* 11.
A description and discussion of the construction and safety features of this unique tanker are given. Its capacity is about 33,000 bbl. of propane. Warren petroleum has installed new terminal propane storage at Norsworthy, Texas and Newark, N. J. for use in collecting and receiving the tanker's cargo.

H. R. Batchelder

Transmission

Miller, B. GAS TRANSPORTATION SYSTEM CALCULATIONS. *Gas Age* **100**, 25-28 (1947) *October* 16.

A complete description of API line pipe specifications is presented. It is well worth reading.

J. D. Parent

Miller, B. GAS TRANSPORTATION SYSTEM CALCULATIONS. *Gas Age* 100, 39-44 (1947) *November* 13.

Specifications for pipe as to analysis and mechanical properties are considered in this installment.

J. D. Parent

Use of Natural Gas

Cuthrell, H. H. WHAT NATURAL GAS CAN DO FOR THE MANUFACTURED GAS INDUSTRY. *Gas Age* 100, 38-39, 76 (1947) *October* 30.

Advantages and disadvantages of natural gas are presented principally from the point of view of its proposed usage at Brooklyn Union Gas Company. Some advantages anticipated are: economy of fuel costs, relief of production capacity problem, greater continuity of supply and greater freedom from labor problems.

J. D. Parent

Water Injection

Morris, W. S. RESULTS OF WATER INJECTION IN WOODBINE RESERVOIR OF EAST TEXAS FIELD. *Oil Gas J.* 46, 245-246, 250, 258 (1947) *November* 15.

Salt water can be sent back to the reservoir. This aids in pressure maintenance as well as in avoiding damage to vegetation.

J. D. Parent

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Synthesis of Fuel from Coal

Pursglove, J., Jr. WILL COAL HELP TO MEET THE FUTURE NEEDS FOR GASEOUS AND LIQUID FUELS? *Petroleum Refiner* 26, 198-200, 202 (1947) *November.*

A discussion is given of the relationship between the increasing demands for gas and petroleum products and the diminishing reserves, as well as the part which coal may play in the future to fill the gap. The plans of the Pittsburgh Consolidation Coal Company for the production of synthesis gas from coal and the conversion to liquid and gaseous fuels are described briefly. The author states that increasing cooperation between the gas, oil and coal industries is a necessity, and that the government must encourage such competition.

H. R. Batchelder

7. ANALYTICAL METHODS AND TESTS

Dissolved Oxygen Test

Pinkney, E. T. and Young, R. S. SIGNIFICANCE OF TEMPERATURE IN TITRATION OF IODINE WITH WINKLER TEST FOR DISSOLVED OXYGEN. *Combustion* 19, 35-37 (1947) *October.*

The sensitivities of various starches were ex-

amined at temperatures ranging from 33 to 105°F. to determine the optimum temperature conditions for the starch-iodine reaction in the Winkler test for dissolved oxygen at low concentrations. The starch-iodine reaction was found to have its maximum sensitivity at a temperature of approximately 50°F. Owing to the difficulty of cooling samples to the required temperature, the authors suggest that when determining very low oxygen concentrations an alternative to the Winkler procedure be employed.

Authors' abstract

Sampling of Hydrocarbon Mixtures

Dibeler, V. H. and Mohler, F. L. ANALYSIS BY THE MASS SPECTROMETER OF A LIQUEFIED HYDROCARBON MIXTURE CONTAINING C_3-C_5 PARAFFINS AND OLEFINS. *J. Research Natl. Bur. Standards* 39, 149-154 (1947) *August.*

A series of tests were made to examine the accuracy of sampling methods of liquid hydrocarbon mixtures. Two methods of sampling were used. In one the mixture was allowed to evaporate into an evacuated chamber, and in the other, the entire mixture was chilled and a liquid sample was drawn off and expanded into the chamber. The tests were made on mixtures of known composition and analysis was carried out with a Consolidated mass spectrometer. The second of the two sampling methods gave consistently good agreement with the correct composition. The first method gave varying compositions, depending on the rate of evaporation.

S. Katz

Vapor-Liquid Equilibrium Determination

Rogers, J. W., Knight, J. W. and Choppin, A. R. AN IMPROVED APPARATUS FOR DETERMINING VAPOR-LIQUID EQUILIBRIUM. *J. Chem. Education* 24, 491-493 (1947) *October.*

A simple procedure for studying liquid-vapor is described. The apparatus is an adaptation of the Cottrell boiling point apparatus, modified by the addition of a side arm and a three way stopcock for sampling. The arrangement is said to be somewhat simpler than the Othmer apparatus. A description of the procedure used to determine the equilibrium curves for two binary systems and also a molecular weight determination by boiling point elevation are included in the paper.

S. Katz

8. GENERAL AND PHYSICAL CHEMISTRY

Fluid Flow

Brownell, L. E. and Katz, D. L. FLOW OF FLUIDS THROUGH POROUS MEDIA.—PART II. *Chem. Eng. Progress "Trans. Section"* 11, 601-612 (1947) *November.*

The concept of the Reynolds number presented in the previous paper is expanded to include the simultaneous flow of two homogeneous fluid phases through porous media. This is accomplished by treating each of the two phases as a single phase with modifications for the effect of one fluid on the other. The wetting fluid flows through the same porous medium as would a single phase, but a velocity correction must be applied to account for the proportion of wetting fluid that is replaced by the other fluid. The nonwetting fluid is considered as flowing

through a porous bed which has a sphericity change and a porosity reduction due to the layer of the other fluid. An example problem is given to demonstrate the use of these relations for calculating "steady" state, two-phase flow through porous media.

Excerpt from authors' summary

9. ORGANIC CHEMISTRY

Chemicals from Petroleum

Smoley, E. R., Torrey, R. M. and Kniel, L. CHEMICALS FROM PETROLEUM. *Petroleum Refiner* **26**, 136-140 (1947) *November.*

Chemicals made from petroleum are increasing greatly in amount and in variety. In 1946 total production reached almost four billion pounds and accounted for 5 per cent of total U. S. production of methanol, 50 per cent of ethanol, 100 per cent of isopropyl alcohol, 75 per cent of acetone, 35 per cent of n-butyl alcohol, 90 per cent of amyl alcohol, major part of xylenes and a large part of acetic anhydride. Expansion of this field is expected. The authors discuss various aspects of the subject including information particularly on the production of ethylene as an intermediate.

H. R. Batchelder

Cyclopentane

Szasz, G. J., Morrison, J. A., Pace, E. L. and Aston, J. G. THERMAL PROPERTIES OF CYCLOPENTANE AND ITS USE AS A STANDARD SUBSTANCE IN LOW TEMPERATURE THERMAL MEASUREMENTS. *J. Chem. Phys.* **15**, 562-568 (1947) *August.*

The heat capacity of cyclopentane was redetermined calorimetrically in the temperature range between 14° and 300°K. The paper presents the heat capacities for the three crystalline states and the liquid state in this range. Transition temperatures and heats of transition are also given, and the data are compared with other determinations.

S. Katz

Heats of Formation and Isomerization

Prosen, E. J., Johnson, W. H. and Rossini, F. D. HEATS OF FORMATION AND ISOMERIZATION OF THE EIGHT C_8H_{12} ALKYLCYCLOHEXANES IN THE LIQUID AND GASEOUS STATES. *J. Research Natl. Bur. Standards* **39**, 173-175 (1947) *August.*

The following properties of the eight alkylcyclohexanes have been determined: the heats of formation at 25°C. in both the liquid and the gas states and in the gas state at 0°K., and the heats of isomerization of ethylcyclohexane into the seven dimethylcyclohexanes at 25°C. and 0°K.

S. Katz

Raman Spectra

Fenske, M. R., Braun, W. G., Wiegand, R. V., Quiggle, D., McCormick, R. H. and Rand, D. H. RAMAN SPECTRA OF HYDROCARBONS. *Anal. Chem.* **19**, 700-765 (1947) *October.*

Most research on spectroscopic methods of anal-

ysis has dealt with the infrared and ultraviolet. Raman spectra possess a number of useful features but limitations due to the slowness of the photographic method and the absence of suitable recording methods have delayed its acceptance. Raman spectra may be made in any convenient part of the spectrum. The method is useful where large concentrations of material are involved, and thus complements infrared and ultraviolet techniques which are best for low concentrations. A recording grating instrument is described and analytical procedures for handling mixtures, especially the hydrocarbons, are given in detail. A brief correlation of Raman data with molecular structure is given. The paper concludes with sets of tables of physical properties and Raman charts for 172 hydrocarbons. These include 76 paraffins, 29 olefins, 32 naphthenes, and 3 diolefins, 30 aromatics and two other hydrocarbons.

S. Katz

Distillation

Fenske, M. R., Carlson, C. S. and Quiggle, D. SOLVENT SEPARATION OF HYDROCARBON MIXTURES BY VAPOR-LIQUID EXTRACTION. *Ind. Eng. Chem.* **39**, 1322-1328 (1947) *October.*

Liquid-vapor equilibrium data for the methylcyclo-hexane-toluene-aniline system at one atmosphere has been obtained. Aniline improves the ease of separation of the two hydrocarbons by distillation, but it must be introduced near the top of the column so that it may be kept in the liquid phase. A very important statement is made: "it is frequently found that the height equivalent to a theoretical plate in the extractor is from five to twenty times as large as the height equivalent to a theoretical plate in the distillation column." Thus, although less theoretical stages are required for an extraction process than for distillation, the space required may not be greatly different.

J. D. Parent

10. CHEMICAL ENGINEERING

Adsorption

SEPARATION BY ADSORPTION. *Chem. Ind.* **61**, 625-631 (1947) *October.*

This is a general article but the Union Oil Company's hypersorption process is stressed. This is a continuous process involving regeneration and recirculation of adsorbent which is passed in a rectifying column countercurrent to the gas flow. Separate fractions can be obtained.

J. D. Parent

Pressure Drop Data

Leva, M. and Grummer, M. PRESSURE DROP THROUGH PACKED TUBES—PART II. *Chem. Eng. Progress "Trans. Section"* **11**, 633-638 (1947) *November.*

The effect of surface roughness of the packing particles upon the pressure drop has been investigated. The results indicate that, all other conditions being the same, the pressure drop through very rough particles, such as Aloxite granules, is more than twice that through smooth packings, as, for example, glass or porcelain. The effect of roughness upon the pressure drop has been compared with that of the voids in the bed. It was shown that the voids in the bed influence the pressure drop to a much greater extent than does the surface

roughness. It was stressed that the effect of the surface roughness upon the pressure drop would have escaped observation had the relationship between pressure drop and voids not been established first. The effect of roughness of the packing particles upon the pressure drop was compared with the effect of pipe surface roughness upon the pressure drop for flow through empty conduits.

Authors' summary

Ternary Systems

Scheibel, E. G. and Friedland, D. CORRELATION OF VAPOR-LIQUID EQUILIBRIA DATA FOR NONIDEAL TERNARY SYSTEMS. *Ind. Eng. Chem.* 39, 1329-1334 (1947) *October.*

A method is proposed for predicting activity coefficients for ternary systems when such data are available for the binary systems involved. Excellent results are obtained.

J. D. Parent

Thermodynamics

Edmister, W. C. APPLICATIONS OF THERMODYNAMICS TO HYDROCABON PROCESSING. PART II. BASIC DEFINITIONS AND CONCEPTS. *Petroleum Refiner* 26, 83-88 (1947) *August.*

Part II in this series deals with some of the basic concepts of thermodynamics. The mathematical foundations of thermodynamics are presented concisely and very skillfully. This is followed by a consideration of the first law and the related functions, enthalpy, heat capacity and Joule-Thomson coefficient. It is, perhaps, unfortunate that delta is used in place of the partial differential in this section, since the former symbol has a very special meaning in other treatments of thermodynamics.

S. Katz

Edmister, W. C. APPLICATIONS OF THERMODYNAMICS TO HYDROCARBON PROCESSING. PART III. ENERGY AND ENTROPY FUNCTIONS. *Petroleum Refiner* 26, 105-111 (1947) *September.*

The third paper in the series discusses entropy, enthalpy and free energy. A discussion of reversibility and irreversibility is followed by the development of the Carnot Cycle.

S. Katz

Edmister, W. C. APPLICATIONS OF THERMODYNAMICS TO HYDROCARBON PROCESSING. *Petroleum Refiner* 26, 99-105 (1947) *October.*

Part four of this series deals with the thermodynamics of the perfect gas. The special forms of the common thermodynamic functions when applied to perfect gases are derived. The construction of Mollier diagrams for a perfect gas is given in detail. Compression equations are developed, with especial consideration for adiabatic paths.

S. Katz

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Automatic Control

Parten, L. W. PRINCIPLES OF AUTOMAT-

IC CONTROL AS APPLIED TO NATURAL GAS OPERATIONS. *Petroleum Refiner* **26,** 121-128 (1947) *October.*

This paper, presented at the Second Annual Short Course in Gas Technology, discusses the theory and applications of the on-off, proportional, and proportional with reset controllers. For the gas industry with the proportional type is used and is generally satisfactory if a narrow proportional band is used. Where a wide proportional band is necessary, or extremely close control is essential and widely changing load conditions are present, then the proportional with reset type should be specified.

J. J. First

Automatic Control on Pipe-Line

Batchelder, C. D. and Rockwell, R. A. AUTOMATIC CONTROL ON PORTLAND-MONTREAL PIPE-LINE. *Oil Gas J.* **46,** 74-76 (1947) September 27.

The article discusses the changing of the operation of the Portland-Montreal crude oil pipe line from full manual to automatic control, shows results obtained with the new control system and tells of the development of the control equipment. Reasons for the changeover were: to stop contamination of the various grades of crude oil resulting from the use of tanks to absorb excessive throughput of the preceding station, to maintain a controlled suction pressure to the pumps, to limit the maximum discharge pressure, and to simplify the operators' and dispatchers' work.

J. J. First

Gaging Methods

Keane, C. C. GAGING METHODS IN ATMOSPHERE AND LOW PRESSURE STORAGE. *Oil Gas J.* **46,** 285, 292 (1947) *November* 15.

Of the three tank-gaging methods, the pole or hand line has the lowest investment cost but the labor cost may quickly dissipate the investment saving; in the float-operated automatics which offer visible reading at the tank, the investment costs increase appreciably but the labor to read them accomplishes 75% more gage readings in the allotted time; in the remote reading equipment, investment costs are greatest but labor costs are eliminated and readings of many tank levels may be obtained almost simultaneously. The many types of remote reading gages are described. The hand line has its place where tank level determinations are desired no more frequently than gravity, water content and sediment, all of which require tank climbing. The author expresses the need of the industry for a gage which would accurately determine net or gross barrels by direct reading and would also indicate temperature, gravity, as well as water and sediment of the liquid volumes under scrutiny.

J. J. First

Gas Flow Meter

NEW TYPE GAS FLOW METER DEVELOPED. *Gas Age* **100,** 16, 52, 54 (1947) October 16.

A new type of gas flow meter, still in the experimental stage is briefly described in this article. The new meter depends on changes in flow to compress or extend electrical strain gages which strain varies their resistance to an electrical current. Electrical variations cause a deflection in a sensitive recorder galvanometer which, in turn, automatically controls a slide wire resistor contained in the recorder and restores balance to the galvanometer. A

pen, mechanically attached to the slide wire indicates the change on a moving chart. The recorder is modified with a variable shunt resistance so that its measurements include changes in volume occasioned by variations in the static pressure of the gas being measured.

J. J. First

Heat Exchanger

Whistler, A. M. and Braun, C. F. EFFECT OF LEAKAGE AROUND CROSS-BAFFLES IN A HEAT EXCHANGER. *Petroleum Refiner* **26**, 114-118 (1947) *October.*

Leakage is caused by clearance between cross-baffles and the inside diameter of the shell which must be provided for purposes of shop assembly and maintenance. Fluid leaks through this clearance result in loss of efficiency because (1) the exchanger must transfer heat at a lower temperature difference than in a perfect exchanger and (2) the lowered fluid velocity across the tubes results in a lower heat transfer rate. A mathematical expression is derived for the loss of temperature difference and the correction factor is plotted on a chart which may be used if the leakage is known. In the majority of cases the loss in temperature difference is less than five percent. Lowered velocity due to baffle clearance is also a function of baffle spacing and is shown as a series of curves for a 24 in. i.d. exchanger. The necessary correction may be appreciable, especially for close spacings. Baffle clearance used must be a compromise among (1) efficiency, (2) practical manufacture and (3) maintenance. Specification of impractical clearance is bound to result in either high cost or handfitting that actually results in more clearance than planned.

J. J. First

Heat Pump

Sporn, P. and Ambrose, E. R. HEAT-PUMP SYSTEM USING WATER STORAGE. *Mech. Eng.* **69**, 899-906 (1947) *November.*

A discussion of a large heat pump installation utilizing a large volume water storage is given. This type of installation would be necessary where air is used as the source of heat and air temperatures vary over a wide range. Data is not available on the heat pump discussed since the water storage system was not installed at the time of writing.

E. F. Davis

Instrumentation

Anthes, J. F. INSTRUMENTATION TO ENSURE SAFETY IN THE GAS INDUSTRY. *Gas Age* **100**, 21-23, 68, 70 (1947) *September* 18.

Two general groups of instruments are discussed. The first classification includes those instruments which indicate the concentration of combustible gases or vapors and may be calibrated for a particular combustible up to its lower explosive limit and, if desired, up to 100% concentration. In the gas industry these instruments are used commonly for testing of gas in manholes, testing for leaks from mains and the determination of the safe end point in purging operations and the satisfactory composition of the inert gas as regards the combustible gas content. Representative of the second group are the instruments for the detection and determination of carbon monoxide and hydrogen sulfide and the oxygen deficiency indicator.

J. J. First

Instrumentation of Cycling Plants

Hutchinson, A. J. L. THE INSTRUMENTA-

TION OF CYCLING PLANTS. *Petroleum Refiner* **26, 115-119 (1947)** *September.*

In this article a hypothetical plant flow sheet is selected and various methods of control are discussed. Most of the controls indicated on the flow sheet are standard but some frequently overlooked points which may cause trouble in the plant are discussed and methods of overcoming these difficulties are pointed out.

J. J. First

Remote Pressure Control

Bickel, L. A. REMOTE PRESSURE CONTROL IN DALLAS. *Am. Gas Assoc. Monthly* **29, 431-432, 468 (1947)** *October.*

Seven years ago Dallas installed its "push button control" whereby the pressure of the gas entering the five city gas stations is reduced from field line pressures of 150 to 400 pounds to the minimum required to render proper service to the low pressure distribution system. The pressure control devices are installed in each of the five city gate stations and are actuated by control switches in the company's distribution shop office. Recording pressure gages at the shop office, showing the pressures at critical points in the intermediate high pressure system, allow the maintenance of outlet pressures at the city gate stations at the minimum necessary for supplying the demand. The system which might be termed "remote manual control" is economical and renders dependable service.

J. J. First

Still Head

Kieselbach, R. SIMPLIFIED STILL HEAD WITH AUTOMATIC CONTROL OF REFLUX RATIO. *Anal. Chem.* **19, 815 (1947)** *October.*

A still head of modified design possessing advantages of compactness, ruggedness, and simplicity over conventional types is described. When employed for distillations at atmospheric pressure, no stopcocks are necessary; while under vacuum only one is required. Valves exposed to condensate are used without lubricant which leads to relatively trouble-free operation according to the author.

H. Hakewill

Wet Gas Meter

Parkinson, B. R. THE HISTORY AND RECENT DEVELOPMENT OF THE WET GAS METER. PART I—HISTORY. *Gas J.* (*British*) **252, 101-107 (1947)** *October* **8**: PART II —RECENT DEVELOPMENTS. *Ibid.* **155-161 (1947)** *October* **15.**

The author discusses the invention by Samuel Clegg of the Rotary gas holder with two and three compartments and a water seal, its improvement by John Molam; and the further development, by Samuel Crosley in 1816, into a four chambered water sealed drum wet gas meter. The latter is similar in construction to the wet test meter in use today. The Crosley drum was used as a consumer's meter from 1816 till the end of the century; however, it gradually gave way to the dry meter, which came into practical use in 1844, because of difficulties encountered with the water freezing or evaporating. Today the wet gas meter is practically extinct as a consumer's meter, but it is used widely in scientific laboratories and even competes with the test holder for proving dry meters. Since the four compartments in the Crosley drum further improved through the years are still hand made, the meter is only accurate in units of one revolution, and approximately accurate to ¼ revolution. Recently an addition of four extra compartments (or

"humps") have been added between the four of the Crosley drum. This further developed meter called the Hump drum is designed to give equality in segments of one twentieth of a revolution. Parts of this meter are still hand made so it is still impossible to guarantee complete accuracy in fractions of a revolution and, while it has been provisionally patented, it has not yet been decided whether the additional expense justifies its advantage. The author concludes that the overhead and re-design of the wet test meter has been undertaken in recognition of the fact that measurement is the basis of all scientific methods, and that accuracy in measurement is essential to scientific achievement.

E. Strong

The following article, which has not been abstracted, is called to your attention:

Mattix, E. D. CONTROL OF LIGHT HYDROCARBON FRACTIONATORS SUBJECT TO VARIATIONS IN FEED COMPOSITION AND QUANTITY. *Petroleum Refiner* **26**, 130-134 (1947) September.

12. MATERIALS OF CONSTRUCTION

Chemical Erosion of Steel

Evans, R. C., Horn, H., Shapiro, Z. M. and Wagner, R. L. THE CHEMICAL EROSION OF STEEL BY HOT GASES UNDER PRESSURE. *J. Phys. Colloid Chem.* **51**, 1404-1429 (1947) *November.*

The erosion of steel by the products of explosion of gas mixtures increases with increasing flame temperature and concentration of carbon dioxide, sulfurous gas, nitrous oxide and hydrogen. When minute quantities of ammonia are added to the eroding gases, the increase is greater at lower concentrations of ammonia. The maximum erosive action due to hydrogen, which occurs at about 3.4% hydrogen at 2160° K. and a CO to CO_2 ratio of 3.5, greatly overshadows the effect of the other trace gases studied. It is proposed that the erosive action caused by the erosive gases except carbon dioxide might be due to the reaction of carbon monoxide and steel to form iron carbonyl under the influence of the trace gases as catalysts. Since carbon dioxide, when present in quantity, probably inhibits the carbonyl reaction, some other mechanism such as oxidation or melting must be used to explain the erosion due to flame temperature and carbon dioxide.

J. J. First

Corrosion

Menaul, P. L. INHIBITING SUBSURFACE SULFIDE CORROSION. *World Oil* **127**, 150-152, 155 (1947) *October.*

Formaldehyde was successfully used as a corrosion inhibitor in sour crudes and sulfide containing oil fields by injecting one quart of it per 50 gallons of water produced in the well. The comparison of different wells before and after treatment as to its cost, saving or loss, and the length of time treated is discussed in this article.

S. Mori

Materials of Construction

CHEMICAL ENGINEERING MATERIALS OF CONSTRUCTION. *Ind. Eng. Chem.* **39**, 1193-1264 (1947) *October.*

The literature of the field of chemical engineering materials of construction is reviewed and interpreted. The literature is covered approximately from the start of World War II. The material is divided into groups as follows: aluminum alloys; carbon and graphite; copper, wrought and copper-base alloys; elastomers; fibers; glass; iron, mild steels, and low alloy steels; lead, tin, zinc and their alloys; nickel and high-nickel alloys; plastics; refractories; hard rubber; stainless steel, and other ferrous alloys; chemical stoneware; wood; codification.

L. Ciboch

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